

New Cones from Oman and the status of *Conus boschi* (Gastropoda; Conidae) *

R.G. MOOLENBEEK and H.E. COOMANS

Zoölogisch Museum Amsterdam,
P.O. Box 4766, NL-1009 AT Amsterdam, The Netherlands

ABSTRACT. *Conus boschorum* and *C. biraghii omanensis* are described as new to science. As far as we know both have a limited distribution (Masirah island and Hallaniyah Islands [=Kuria Muria Islands]). After studying additional material of *C. boschi* Clover, 1972, it must be considered a junior synonym of *C. melvilli* Sowerby III, 1879.

KEYWORDS: Gastropoda, Conidae, *Conus*, Oman, nomenclature.

INTRODUCTION

For over a century the Arabian Peninsula has been a major and mystical source of conchological treasures. In recent years knowledge of the molluscs of the Sultanate of Oman has increased after the publication of "Seashells of Oman" by Donald and Eloise BOSCH (1982). They discovered the special malacological richness of Masirah Island, which is situated in the Arabian Sea, just off the coast of Oman. This island has been visited by only a few shell collectors and from their findings we know that several endemic species occur there: *Cypraea teuleri* Cazenavette, 1846; *Conus boschi* Clover, 1972; *Acteon eloiseae* Abbott, 1973; *Latirus bonnieae* Smythe, 1985; *Conus stocki* Coomans & Moolenbeek, 1990. Other Masiran species are found on the neighbouring coast of Oman too, which can be explained by the fact that the island is only separated from the Arabian peninsula by a narrow strait of about 6 to 10 m depth.

Several years ago Dr D.T. Bosch showed us some small, worn cone shells from Masirah island, which at first sight we considered juveniles. When publishing on the family Conidae from Oman in detail (COOMANS &

MOOLENBEEK, 1990) we had no idea to which *Conus* species these "juveniles" should be assigned.

In November 1991 the first author joined an expedition, initiated by Dr. Bosch, to obtain more material and new data concerning the malacofauna from the Oman coast. During a week of intensive collecting on Masirah Island, we discovered the habitat of these "juvenile" cones. They live subtidally in a bottom community with algae, sponges, and other invertebrates. No large specimens were collected. The only other sympatric *Conus* species were *Conus ardisiaceus* Kiener, 1845 and *Conus boschi* Clover, 1972. These facts gave rise to the idea that our "juveniles" should be considered as two small *Conus* species. After comparison with other Indo-Pacific species of the genus *Conus* we are convinced that both species belong to unnamed taxa which are described below. All material is deposited in the Zoölogisch Museum Amsterdam (University of Amsterdam), the Netherlands, unless otherwise stated.

*Studies on Conidae no. 17/ Studies on the marine molluscan fauna of Oman, no. 7.

TAXONOMY

Conus boschorum n. sp.

Figs 1-6, 17

Type Material. Holotype (figs 1-2) in Zoologisch Museum Amsterdam (ZMA Moll. 3.92.001) and 370 paratypes (ZMA Moll. 3.92.002), partly preserved in alcohol. Paratypes will be distributed to the Oman Natural History Museum (Muscat), the National Museum of New Zealand (Wellington) and to the private collections of Dr. D. Bosch (USA), Dr. D. Röckel (Germany), R.M. Filmer (England), P.L. van Pelt and H. Dekker (both the Netherlands).

Type Locality. Sultanate of Oman, Masirah Island, Sur/Umm Rasas, 0.1-0.6 m below low tide, Sta. 91/99, November 1991. leg. R.G. Moolenbeek & H. Dekker.

Description of the Holotype. (figs 1-2). Length 11.0 mm, width 5.9 mm. Shell turbanate, thin, glossy, low biconical. Protoconch paucispiral, 1 1/2 bulbous whorls, partly with an indented sculpture. Teleoconch with 4 whorls. Spire stepped, straight to a little concave, whorls canaliculated with irregular growth lines. Shoulder sharply angulated. Body whorl smooth except lower third which has 11 spiral grooves on the ventral and 7 on the dorsal side.

Aperture slender, somewhat expanding towards the base.

Colour. Spire white with irregular dark brown spots. On the bodywhorl are 8 brown spots which continue below the shoulder and are connected to a broader blackish band. Just below the shoulder a small light band is followed by a somewhat broader blackish band. Middle of bodywhorl with a light band in which are about 5 fine brown spotted spirals. In this light band are many irregularly formed milky white spots. Base blackish with irregular white spots in. Periostracum thin, nearly transparent, more prominent on the shoulder forming fine fringes.

Operculum horny, orange-brown, measurements 2.8 x 0.9 mm. Animal not studied alive. After its preservation in alcohol it was blackish, eye stalks white with the eye black. Proboscis with a white tip.

Variability. There is little variation in shape of the shells. However, the colour pattern is most variable (figs 3-6). Especially juvenile specimens can be completely yellowish to orange (fig. 6) with only dark brown spots on the spire. Larger specimens have grey to nearly black colour patterns. About 70% of the studied material consists of specimens with the black colour pattern, but the larger specimens are more greyish. The pattern is very irregular, although in general a lighter mid-body band is present. Fine spiral bands of brown spots can cover the entire body whorl. The largest paratype has a length of 12.6 mm, width 7.0 mm.

Other Material Studied. One shell at Umm Rasas, Sta. 91/99; Nine shells at Ras Abu Zabil, Rounders Bay, 6 m SCUBA, Sta. 91/123, leg. Gary Keat (RAFO). Two shells were found on the west coast of Masirah Island, Valley of the Moon beach, Sta. 91/93; Another two living specimens were collected on Al Hallaniyah (Sta. 91/60), which have a more pronounced sculpture on the protoconch. To find out whether these Al Hallaniyah specimens are conspecific more material and further research is needed. All material collected in November 1991, leg. R.G. Moolenbeek & H. Dekker.

Etymology. *Conus boschorum* is named after Donald and Eloise Bosch, to express our respect for all the activities they have initiated to stimulate malacological research in Oman.

Discussion. Due to its small size, this new species could easily be considered a juvenile of a larger species. Juveniles of *Conus acuminatus* Hwass, 1792, with a more slender outline, have less canaliculated whorls with one or two, sometimes vague, spirals on it. Also, that species has never been recorded

from Oman. *Conus boschorum* n.sp. lives sympatrically with *C. ardisiaceus* Kiener, 1845, *C. boschi* Clover, 1972 and *C. biraghii omanensis* n.ssp. Of these three taxa, only juvenile specimens of *C. ardisiaceus* show resemblance but differs in having spiral grooves on the spire whorls (figs 7-8). Also its shape is more bulbous and it grows larger. In shape and size *C. rutilus* Menke, 1843 from southwest Australia shows similarities. However, its protoconch is more nipple like and the spire is slightly coronated. *C. klemæ* Cotton, 1953 from western Australia has a more or less similar outline but has spiral grooves on the spire. Also that species grows much larger.

We have two live collected shells from Al Hallaniyah [=Kuria Muria Island], which might be *C. boschorum* n.sp. However there are slight differences in colourpattern and protoconch structure. Additional material is needed for comparison.

Conus biraghii
(G. Raybaudi, 1992)
Figs 9-10

This small species was recently described as *Leptoconus (Thoraconus) biraghii* from Somalia. The description was based on a rather monomorph sample, and details on the sculpture of the protoconch were not available. We could study one of the paratypes of *C. biraghii* (figs 9-10) present in the collection of D. Röckel (Germany).

From Masirah Island we have specimens of a small *Conus* species, which has a number of characters in common with *C. biraghii*. Our comparison leads to the conclusion that a subspecific status for the Masirah material is justified.

The shell characters of *C. biraghii* do not assign it to *Leptoconus*, which is based on type species *C. amadis* Gmelin, 1791. The latter is a large species with different size, shape, sculpture and pattern. The same can be

applied to *C. exiguus* Lamarck, 1810, type species of *Thoraconus* Da Motta, 1991.

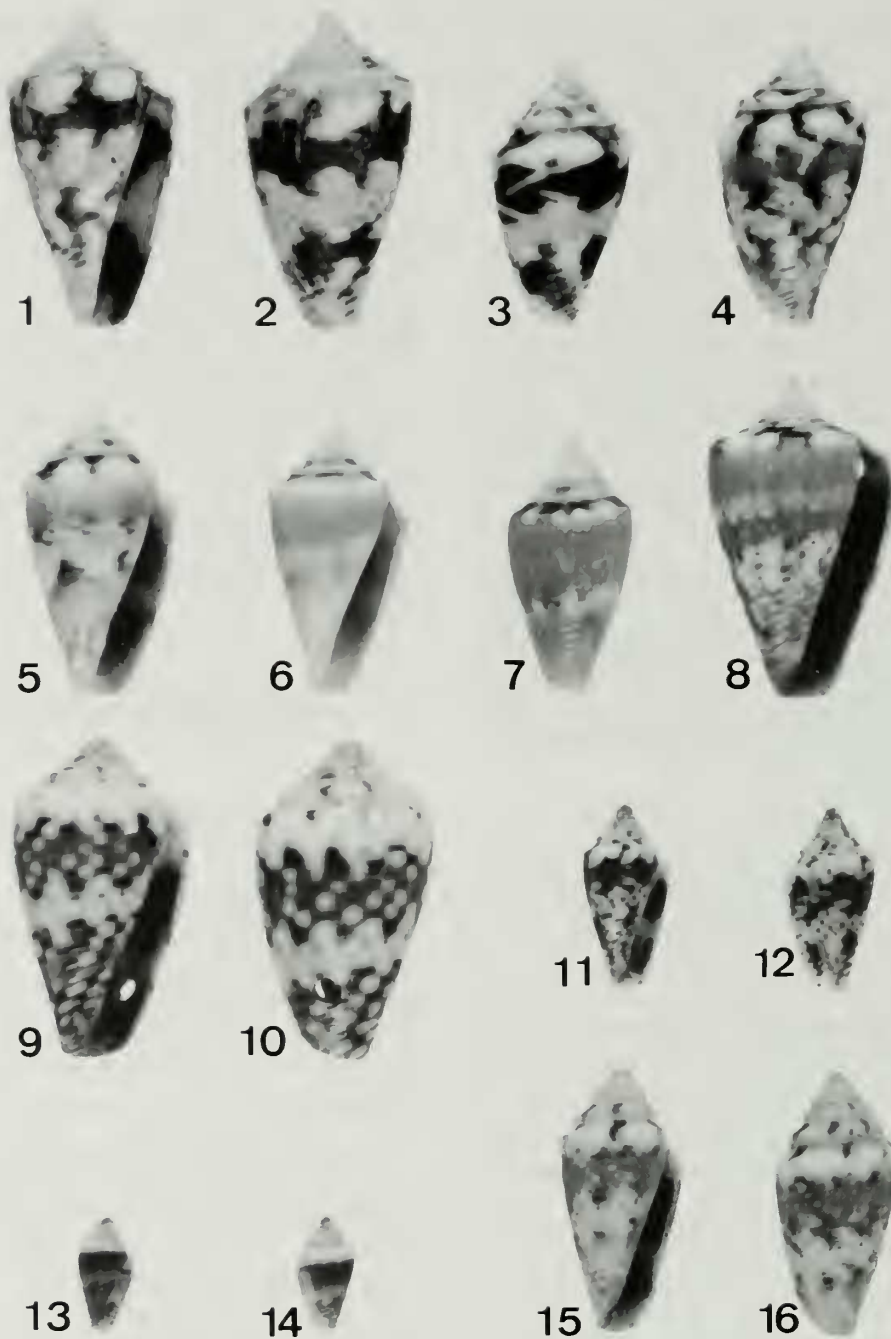
We are of the opinion that the generic classification of the Conidae by DA MOTTA (1991) is premature. The 30 new subgenera he described, will create more confusion rather than being a serious attempt to classify the hundreds of (sub)species in this family. The taxonomy of the Conidae is still far from being settled. This is due to the large number of species (about 600 recent) and the growing number of species [names] every year. Also variability, abundance of (sub)specific names (far over 2000 fossil and recent), homonymy, synonymy, unknown distribution patterns and incorrect localities need more research. Therefore we prefer to use the genus *Conus*.

***Conus biraghii omanensis* n.ssp.**
Figs. 11-16, 18

Type Material. Holotype (ZMA Moll. 3.92.003) and 110 paratypes, partly preserved in alcohol (ZMA Moll. 3.92.004). Paratypes will be distributed to the Oman Natural History Museum (Muscat), the National Museum of New Zealand (Wellington) and to the private collections of Dr. D.T. Bosch, Dr. D. Röckel, P.L. van Pel, R.M. Filmer and H. Dekker.

Type Locality. Sultanate of Oman, Masirah Island, Sur /Umm Rasas, 0.1-0.6 m below low tide, Sta. 91/99. November 1991. leg. R.G. Moolenbeek & H. Dekker.

Description of the Holotype (Figs. 6-7). Length 7.7 mm, width 3.6 mm. Shell small, biconic, slender, rather solid. Protoconch of 1 1/2 whorls. Initial part mainly white with brown sutures, remaining part brown with minute opisthocline axial rims (folds). Teleoconch consisting of 4 1/2 whorls. First teleoconch whorl with one strong spiral groove, gradually a 2nd and 3rd appear. Whorls with microscopic growth lines.



Figs 1-6. *Conus boschorum* n.sp. , Oman, Masirah Island, Sur. 1-2. holotype, length 11.0 mm. 3-6. paratypes, variability in colour pattern, lengths resp. 10.8 mm, 11.6 mm, 12.1 mm, 11.0 mm.

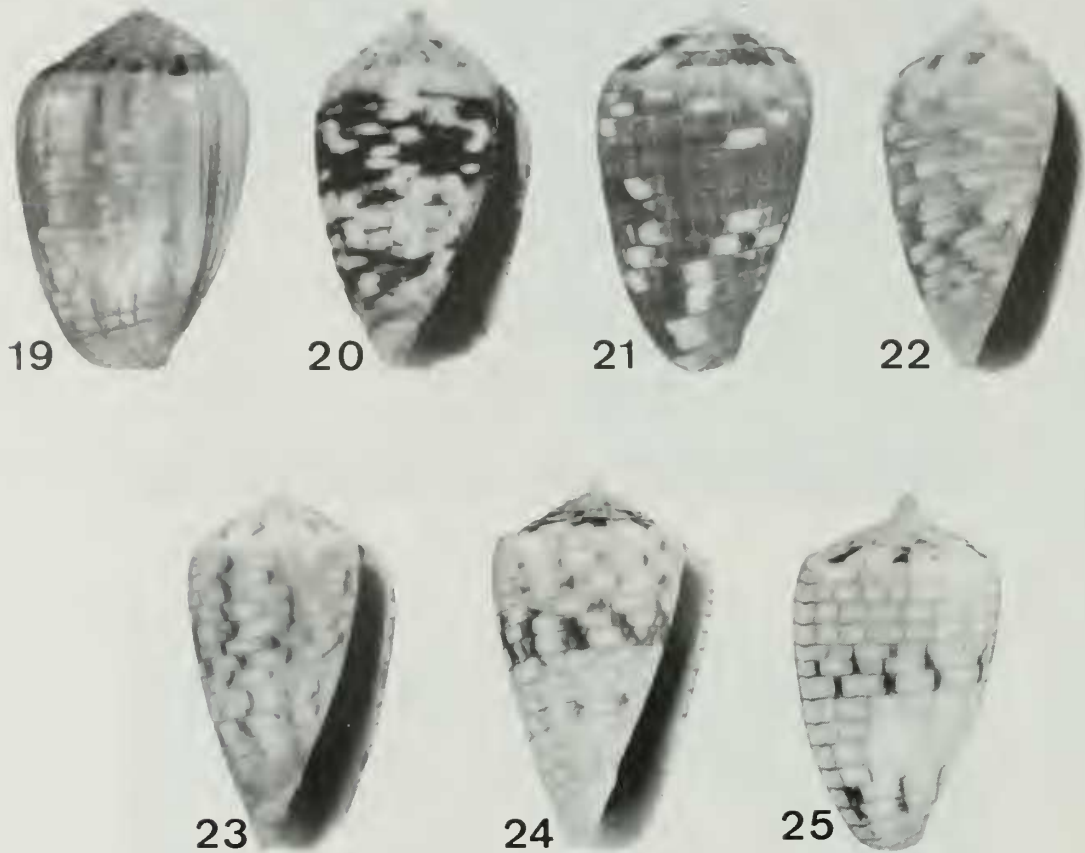
Figs. 7-8. *Conus ardisiaceus* Kiener, Oman, Masirah Island, Sur. Length resp. 10.7 mm and 13.1 mm.

Figs. 9-10. *Conus biraghii* (G.Raybaudi), Somalia, Obja, paratype, length 10.7 mm (coll. D. Röckel).

Figs. 11-16. *Conus biraghii omanensis* n.ssp., Oman, Masirah Island, Sur. 11-12. holotype, length 7.7 mm. 13-14. juvenile paratype, lacking spiral colour pattern, length 4.2 mm, 15-16. paratype, length 10.9 mm.



Figs. 17-18. SEM pictures of protoconchs, Oman, Masirah Islands, Sur. 17. *Conus boschorum* n.sp. 18. *Conus biraghii omanensis* n.ssp.



Figs. 19-25. *Conus melvilli* Sowerby III. 19. holotype of *Conus pusio* Sowerby I and *Conus melvilli* Sowerby III, length 18.8 mm (National Museum Wales, Cardiff, U.K.). 20-25. variation in colourpattern of *Conus melvilli*, Oman, Masirah Island, leg.D.T. Bosch (coll. ZMA), length resp. 29.3 mm, 23.0 mm, 25.8 mm, 20.8 mm, 19.1 mm and 18.0 mm.

Body whorl smooth, with a groove just below the shoulder, which due to the extruded spire, is visible on earlier whorls too. Base dorsally with 7-8 spiral grooves, ventrally a few more. Colour white with greyish upper band. In this band about five spiral white/brown lines. Nearly at the base a 2nd greyish band with 3 spiral lines in it. In between these bands a white area with two or three brown/milky white spotted spiral lines.

Variability. This species shows little variation in shape and colour pattern. Juvenile specimens may have the upper part of the body whorl more or less uniform brown. In a few cases the shells may have more pronounced axial coronation.

Other Material Studied. Two dead collected shells from Maghilah (Sta. 91/94) on the west coast of Masirah Island; one specimen 4 km S. of Ra's Qudufah, Sta. 91/86; Four specimens at Ra's al Ya, Sta. 91/105; one beached specimen at BERS camp, Sta. 91/95; one specimens at the Valley of the Moon beach, Sta. 91/93; Five specimens at Ra's Zafarnat, Turtle rock, 7-8 m SCUBA, Sta. 91/121, leg. Gary Keat (RAFO); On Al Hallaniyah [Kuria Muria Islands, Sta. 91/60] we collected seven juvenile specimens (partly live collected) which seem to have more pronounced spiral sculpture on spire and body whorl. In the province Dhofar, we collected 4 dead specimens at Dar Marbat, Sta. 91/71. All material November 1991, leg. R.G. Moolenbeek & H. Dekker.

Etymology. This subspecies is named after the Sultanate of Oman.

Discussion. The only species which shows some similarities in design is the recently described *Leptoconus (Thoraconus) biraghii* G. Raybaudi, 1992 from Somalia. *Conus biraghii omanensis* differs from the nominate species by having less pronounced coronations and in being more obconic. The spirals on the teleoconch are lacking on *C. b. biraghii*. *Conus papalis* Weinkauff, 1875 from the Philippines

of which several authors doubt the generic status, has more pronounced coronation and strong spiral grooves on the teleoconch. In the Natal Museum (Pietermaritzburg, South Africa) are two unidentified specimens from northern Mozambique, Conducia Bay (leg. K.J. Grosch, no. G 9936) which look identical in shape, size and sculpture to the Oman population. Only the colour of the body whorl is brownish. The holotype of *C. traillii* A. Adams, 1855 in the Natural History Museum, London agrees in colour pattern but differs in being bullet-shaped, completely smooth on the whorls, having deep sutures and lacking a groove below the shoulder.

As long as no detailed description is provided for the population from Somalia we prefer to maintain a subspecific status for the Oman population.

Conus melvilli Sowerby III, 1879
and
Conus boschi Clover, 1972
Figs 19-25

COOMANS & MOOLENBEEK (1982) published on the identity of *Conus pusio* Sowerby, I, 1834 (Fig. 19) and *C. melvilli* Sowerby III, 1879. They concluded that both nominal species were based on the same type specimen and thus are objective synonyms. At that time we concluded that *Conus boschi* Clover, 1972 was a distinct species. However, after having studied more material of *C. boschi* (figs 20-25) recently collected and kindly donated by Donald Bosch, it shows that *C. boschi* on Masirah Island has a large variation in colour pattern. This variation includes the pattern of *C. melvilli* which therefore is the first available name for this taxon. *C. boschi* becomes a junior synonym.

Acknowledgements. We express our gratitude to Donald Bosch, who brought to our attention the interesting malacofauna of Oman and invited us to participate in the Oman

expedition initiated by him. Thanks are due to the staff of the BERS station on Masirah Island for hospitality during our stay. Gary Keat and one of his colleagues (RAFO base) were so kind to collect some samples from deeper water using SCUBA. Peter and Una Dance, Christine and Walter Hägstrom, Donald and Eloise Bosch and Henk Dekker were companions during our collecting activities and always willing to assist us. KLM Oman (Mrs J.W. Creutzberg and J. Simpson) kindly arranged a courtesy air ticket from Amsterdam to Seeb. D. Röckel sent material in loan. Mike Filmer corrected the English text. Mr. L.A. van der Laan (ZMA, University of Amsterdam) made the photographs, the SEM pictures were made by the first author at the Laboratorium voor Elektronenmikroskopie (University of Amsterdam).

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